



82. A method for introducing into a mixing vessel (2) under partial vacuum a liquid component (A) of bone cement to be mixed with a powder-component (B) of bone cement the method comprising the steps of providing a container (9) which has an open interior, threadable cap (18) and means (13) for breaking a glass ampoule placing a glass ampoule (11) containing said liquid component (A) into said open interior, turning said cap (18) for pushing downwards on said ampoule (11) for breaking it against said breaking means (13b) allowing said container (9) to feed the liquid component (A) through an opening (13c) in the container into said mixing vessel (2).

28 33. A method according to claim 32 wherein said container (9) opening (13c) is airtight connected to the mixing vessel (2) and ambient air is allowed to enter into said open interior of the container (9) through an opening (18d) in the cap (18) of the container (9).

29 34. An apparatus for introducing into a mixing vessel (2) under partial vacuum a liquid component (A) of bone cement to be mixed with a powder component wherein said apparatus comprising a container (9) which has an open interior for receiving at least one glass ampoule (11) containing said liquid component and a threadable cap (18) for pushing downwards on said ampoule (11) said interior including a means (13b) for breaking said ampoule (11) when said cap (18) pushes on said ampoule (11) thereby allowing said container (9) to feed the liquid component (A) through an opening in the container, into said mixing vessel (2).

30 35. An apparatus according to claim 34 wherein the container opening is arranged to be air-tight connected to the mixing vessel and in that the cap (18) of the container has an opening (18d) for allowing ambient air to enter into said open interior of the container (9).

3 36. The apparatus of Claim 23, wherein said means for holding and introducing said liquid component (A) is operatively connected to the agitator rod (6b) in order to be used as a handle during mixing.

22 37. A method for successively feeding in an arbitrary sequence batches of a liquid bone cement component (A) into a mixing vessel (2) maintained under vacuum for the preparation of said bone cement wherein said mixing vessel (2) is provided with a predetermined amount of said powder component (B) of said cement, the method comprising the steps of providing a mixing vessel (2) which said vessel is defined by a cylindrical cylinder having an open interior (2a) with a spout (5) attached to one end of said cylinder, and having an axially displaceable bottom (80);

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inserting a mixing agitator (6) within said spout so as to communicate with said vessel interior (2a), said agitator (6) comprised of a tubular rod (6b) having an agitator disk (6a) fixed on one end thereof, said other end being open and defining a mouth, said mouth being located axially above said spout of said vessel, said agitator (6) axially displaced such that said agitator disk (6a) can mix both of said bone cement components (A, B) together;

placing a container which has an open interior for receiving a glass ampoule (11) and a threadable cap (18) for pushing downwards on said ampoule, said interior including a means (13a) for breaking said ampoule (11) when said cap (18) pushes on said ampoule (11) thereby allowing said container to feed liquid (A) into said vessel (2) in said mouth of said tubular rod (6b), and operatively connecting container (9) and rod (6b) for using the container (9) as a handle during mixing, axially displacing said agitator (6) so as to mix said liquid and powder components (A, B) under vacuum, without allowing harmful emissions to escape said mixing vessel.

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88. An apparatus for mixing a liquid and a powder component (A, B) in an interior of a mixing vessel (2) for the preparation of a bone cement, said mixing vessel (2) interior (2a) maintained under a vacuum created from a vacuum source in order to prevent harmful emissions from escaping from said vessel once said liquid and powder components (A, B) are mixed, comprising:

a mixing vessel (2) pre-filled with a powder component (B) of said bone cement said vessel (2) defined by an outer wall (3) having a top end, a bottom end and an interior, said top end formed with a sealable spout (5), said bottom end formed with an axially displaceable bottom (4);

a means (1) for introducing said liquid component (A) into said interior of said mixing vessel (2);

an agitator (6) received within said vessel interior (2a), said agitator (6) comprised of a tubular rod (6b) which extends upwardly out of said interior through said spout (5) and is in communication with the atmosphere and an agitator disk (6a) attached to said tubular rod (6b), an open, first end of said tubular rod defining a mouth and an open, second end of said tubular rod encircled by said disk (6a), said tubular rod (6b) axially displaced within said vessel (2) interior for mixing said bone cement components (A, B);

a removable tightening rod (19) disposed within said tubular rod (6b) for sealing said open bottom rod end from communication with the atmosphere after said liquid component (A) is introduced into said mixing vessel (2), said tightening rod (19) being disposed within said tubular rod (6b) prior to introducing said liquid (A) into said mixing vessel (2);

wherein said means (1) for introducing said liquid (A) into said vessel (2) is

comprised of a container (9) having an interior for containing said liquid (A), a tip (9c) and a tube (26) connected to said tip, said tube (26) having one end inserted into said outer wall (3) of said mixing vessel (2), whereby harmful emissions are prevented from escaping the vessel (2) during introduction of said liquid component (A) due to the vacuum present in said vessel (2) wherein said powder (B) and liquid (A) components are then mixed within said vessel (2) interior (2a) under continuous vacuum from said vacuum source and said atmospheric air is prevented from entering into said vessel (2) due to said tightening rod (19), wherein said harmful emissions caused from mixing said components (A, B) are prevented from escaping said vessel (2).

34 39. The apparatus of Claim 38, wherein the tube (26) is inserted into said outer wall (3) of the mixing vessel (2) near said bottom end.

35 40. The apparatus of Claim 38, wherein said plastic tube (26) is provided with a clip (29) for opening and closing said tube (26) upon demand.

36 41. The apparatus of Claim 38, wherein said container is comprised of a glass ampoule.

37 42. The apparatus of Claim 38, wherein said container is comprised of a collapsible plastic bag.

38 43. A method for mixing a liquid and a powder bone cement component (A, B) in a mixing vessel (2) maintained under vacuum for the preparation of said bone cement wherein said mixing vessel (2) is provided with a pre-determined amount of said powder component (B) of said cement, the method comprising the steps of providing a mixing vessel (2) which said vessel is defined by a cylindrical cylinder having an open interior (2a) with a spout (5) attached to one end of said cylinder, and having an axially displaceable bottom (80); inserting a mixing agitator (6) within said spout (5) so as to communicate with said vessel interior (2a), said agitator (6) comprised of a tubular rod (6b) having an agitator disk (6a) fixed on one end thereof, said other end being open and defining a mouth, said mouth being located axially above said spout of said vessel, said agitator (6) axially displaced such that said agitator disk (6a) can mix both of said bone cement components (A, B) together; providing a tightening rod (19) within said tubular rod (6b) so as to seal said vessel (2a) from said atmosphere; providing a hole in said container (9) wall and connecting a tube between said container (9) and vessel (2) in order to feed said liquid (A) through said tube to said container;

introducing said liquid component (A) into said interior of said vessel (2a); axially displacing said agitator (6) so as to mix said liquid and powder components (A, B) under vacuum, without allowing harmful emissions to escape said mixing vessel.

44. The method of Claim 43, wherein said container (9) is a plastic bag containing said liquid (A) and said container (9) is provided with a tube that connects said container with the vessel wall in order to feed said liquid (A) into said vessel (2).

45. The method of Claim 44, wherein said liquid component (A) is fed into said vessel (2) near said bottom (80).

46. An apparatus for mixing a liquid and a powder component (A, B) for the preparation of a bone cement under vacuum in order to prevent harmful emissions from escaping once said liquid and powder components (A, B) are mixed, comprising:
a mixing vessel (2) defined by an outer wall (3) having a top end, a bottom end and an interior, said top end formed with a sealable spout (5), said bottom end formed with an axially displaceable bottom (4);
a means (1) for introducing by aid of vacuum present in the vessel said liquid component (A) into said interior of said mixing vessel (2) through said sealable spout (5);
an agitator (6) received within said vessel interior (2a), said agitator (6) comprised of a tubular rod (6b) which extends upwardly out of said interior through said spout (5) and is in communication with the atmosphere and an agitator disk (6a) attached to said tubular rod (6b), an open, first end of said tubular rod defining a mouth and an open, second end of said tubular rod encircled by said disk (6a), said tubular rod (6b) axially displaceable within said vessel (2) interior for mixing said bone cement (A, B);
a removable tightening rod (19) disposed within said tubular rod (6b) for sealing said open bottom rod end from communication with the atmosphere prior and after said liquid component (A) is introduced into said mixing vessel (2), said tightening rod (19) being removed from said tubular rod (6b) immediately prior to introducing said liquid bone cement (A) compound into said mixing vessel (2) and being reinserted therein after said liquid (A) is introduced within said mixing vessel, characterized in that said vessel is pre-filled with said powder bone cement component (B) and in that between said vessel bottom (4) and said open second end of said tubular rod (6b) there is a gap (23) behaving like a passage for percolating an air/liquid mixture upwardly through holes (6h) in the agitator disc (6a) to cause liquid component (A) to premix with the powder component (B).

47. The apparatus of Claim 46, characterized in that said means (1) for introducing said liquid (A) into said vessel (2) is comprised of a container (9) having an interior for

~~containing said liquid (A), one end of said container being insertable into said open top end of said tubular rod (6b).~~

~~48. The apparatus of Claim 46, characterized in that said means (1) for introducing said liquid (A) into said vessel (2) is comprised of a container (9) having an interior for containing said liquid (A) one end of said container being insertable into a funnel (50), said funnel (50) having an open neck that is removably inserted into said open end of said tubular rod (6b).~~

~~49. The apparatus of Claim 47, wherein said container is comprised of a collapsible plastic bag.~~

~~50. A method for mixing a liquid and a powder bone cement component (A, B) in a mixing vessel (2) maintained under vacuum for the preparation of said bone cement the method comprising the steps of providing a mixing vessel (2) which said vessel is defined by a cylindrical cylinder having an open interior (2a) with a spout (5) attached to one end of said cylinder, and having an axially displaceable bottom (4);
providing a mixing agitator (6) and inserting it within said spout so as to communicate with said vessel interior (2a), said agitator (6) comprised of a tubular rod (6b) having an agitator disk (6a) fixed on one end thereof, said other end being open and defining a mouth, said mouth being located axially above said spout of said vessel;
providing a tightening means introducing said liquid bone cement component (A) into the vessel (2) so as to seal said vessel (2a) from said atmosphere before and after said liquid component (A) is introduced into said vessel (2a);
removing said tightening means during introduction of said liquid component (A) into said interior of said vessel (2a) near said vessel bottom (4) under the influence of partial vacuum;
re-inserting said sealing means within said tubular rod, thereby sealing said vessel (2a) from said atmosphere;
axially displacing said agitator (6) so as to mix said liquid and powder components (A, B) under vacuum, characterized in that said mixing vessel (2) is provided with a predetermined amount of said powder component of said cement and in arranging between said vessel bottom and said open second end of said tubular rod (6b) a gap (23) behaving like a passage for percolating an air/liquid mixture upwardly through holes (6h) in the agitator disc (6a) to cause liquid component (A) to pre-mix with the powder component (B).~~